

ORDER

**DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION**

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SUBJ: AIRPORT TRAFFIC CONTROL TOWER SITING CRITERIA

1. PURPOSE. This order establishes the mandatory and nonmandatory requirements concerning site and height selection of airport traffic control towers to be established by FAA.
2. DISTRIBUTION. This order is distributed to FAA headquarters division level in the Airway Facilities, Airports, Flight Standards, Systems Research and Development and Logistics Services; division level in the regions, Aeronautical Center, NAFEC and the area offices in Southern and Pacific Regions; and the Airway Facilities and Air Traffic Services to the branch level in the regions.
3. CANCELLATION. Order AF P 6510.16, Air Traffic Control Tower Siting Criteria, dated 31 May 1962 is cancelled.
4. POLICY. The criteria as set forth in Appendix 1, Airport Traffic Control Tower Siting Criteria, shall be adhered to when conducting site and height selection studies for FAA constructed control towers of all operating level
5. IMPLEMENTATION. This order is applicable to all establishment and relocation projects for FAA funded airport traffic control tower and combined station/tower facilities. Insofar as the criteria listed hereunder are determined to be practical and applicable, these requirements may also be used for those control tower projects where the cab and support space are provided by a Sponsor for FAA operational use.

In order that a reasonable effort be made to continually assess the effectiveness of this order and the validity of the requirements stated herein, the regions are to forward one copy of each airport traffic control tower siting study report, upon approval of the regional director, to the Washington office for information purposes. These are to be forwarded to the Chief, Environmental Engineering Division, Airway Facilities Service. A report should be submitted for each current control tower project where the facility site has not yet been selected and for all projects assigned in the future.


J. W. COCHRAN
Director, Airway Facilities Service

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Initiated By: AAF-500

AIRPORT TRAFFIC CONTROL TOWER SITING CRITERIA

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1. INTRODUCTION. The efficiency of present and future air traffic control service provided by the Federal Aviation Administration through its operations personnel in the airport traffic control tower is influenced by the location and height of the tower cab relative to the airport complex and its terrain.

This document sets forth the procedures to be followed, the criteria to be used, the considerations to be made, and the methods of site evaluation and site selection.

2. SITING CRITERIA.

- a. General Requirements. Siting and height determination require the use of sound engineering principles taking into consideration factors relating to the economics of each selection such as accessibility to utilities, subsoil and ground water conditions, expansion possibilities, etc., as well as the selection of a site requiring a tower of the minimum height necessary to satisfy the specific requirements given below.

- b. Specific Requirements.

- (1) Mandatory Siting Requirements.

- (a) Maximum visibility of airborne traffic patterns must be available. Primary consideration must be given to the local control position of operation; however, all operating positions should have this capability. A clear, unobstructed and direct view of the approach to the end of the primary instrument runway and all other active runways and landing areas should be available.
 - (b) Complete visibility must be available to all airport surface areas utilized for movement of aircraft which are under the control of the airport traffic control tower. Primary consideration must be given to the air traffic ground control position of operation; however, all operating control positions should have this capability. A clear, unobstructed and direct view of taxiways and runways should be available.
 - (c) The site plot must provide sufficient area to accommodate the initial building and any planned future extensions, personnel and facility vehicle parking, fuel storage tanks, exterior transformers, etc., as dictated by location requirements.

- (d) Federal Aviation Regulations, Part 77, Objects Affecting Navigable Airspace, including all amendments, must be complied with unless deviations are absolutely necessary to meet the other mandatory siting requirements given above.
 - (e) The tower must not be sited where it will derogate the performance of existing or planned electronic facilities (ILS, TVOR, RT/R etc.).
- (2) Nonmandatory Siting Requirements.
- (a) Depth perception of all surface areas to be controlled should be available. This is the ability to differentiate the number and type of grouped aircraft and/or ground vehicles, and to observe their movement and position relative to the airport surface areas. Perception is enhanced where the controller's line of sight is perpendicular or oblique, not parallel, to the line established by aircraft and/or ground vehicle movement, and where the line of sight intersects the airport surface at a vertical angle greater than 35 minutes (reference Appendix 1, paragraph 3).
 - (b) The tower cab should be oriented to face north or alternatively east, south, or west, in that order of preference for control towers in the northern hemisphere. In areas where snow accumulates on the ground surface, a southern orientation should be avoided. Avoid orientations that will place a view of the runway approach in line with a rising or a setting sun.
 - (c) Visibility should not be impaired by direct or indirect external light sources. Such sources may be ramp lights, parking area lights, and reflective surfaces.
 - (d) Visibility should be available for all ground operations of aircraft and to airport ground vehicles on ramps, apron and tiedown areas, and test areas.
 - (e) Consideration must be given to local weather phenomena to preclude restriction to visibility due to fog or ground haze.
 - (f) Exterior noise should be at a minimum and sites should be evaluated through a comparison of expected noise levels at each location.
 - (g) Access to the site should avoid crossing areas of aircraft operations.

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- (h) Consideration should be given to planned airport expansion as shown on the airport master plan. Particular attention should be given to future construction of buildings, hangars, new or extended runways and taxiways, etc. to preclude the necessity for relocation of the control tower at a future date.
- (i) The tower should be sited in an area which is relatively free of jet exhaust fumes and impairments to visibility such as industrial smoke, dust and fumes.

3. TOWER CAB EYE LEVEL DETERMINATION.

- a. General. To meet the minimum requirements for visual depth perception paragraph 2.b.(2), the line of sight from the tower cab eye level must intersect the grade of the airport traffic surface in question at an angle of 35 minutes or greater. Success in the application of the principle to a particular site requires the accurate determination of:
 - (1) The sections of the airport traffic surface where adequate visibility is the most difficult to obtain.
 - (2) The grade of the airport traffic surface for each section considered. Extreme care should be taken to determine the grade of a section. Where the section in question encompasses a rising taxiway grade leveling off at a runway end (the farthest point), the grade of the runway end in the direction of the line of sight is the most important. The movement of aircraft and/or ground vehicles on the taxiway will be discernible if the 35-minute minimum angle is established relative to the runway grade thus affording the ability to determine the position of aircraft and/or ground vehicles on the runway. However, if the taxiway grade slopes down to the runway end (the farthest point), the 35-minute angle should be established relative to the taxiway.
- b. Minimum Eye Level Determination and Formulas. Assuming the minimum line of sight and grade intersection angle of 35 minutes, and, following determination of the angular slope of the airport traffic surface in question, the minimum eye level elevation for a particular tower site can be determined by the following formula:

$$E_e = E_{as} + D \tan. (35 \text{ min.} + G_s)$$

Par 2

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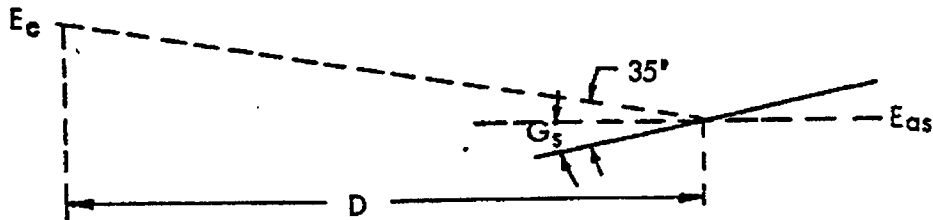
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APPENDIX 1

Where: .

- E_e = Eye level elevation (MSL).
- E_{as} = Average elevation for section of airport traffic surface in question.
- D = Distance from proposed tower site to section of airport traffic surface in question.
- G_s = Angular slope of airport traffic surface measured from horizontal and in direction of proposed tower site.

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Example #1:



$$E_e = ?$$

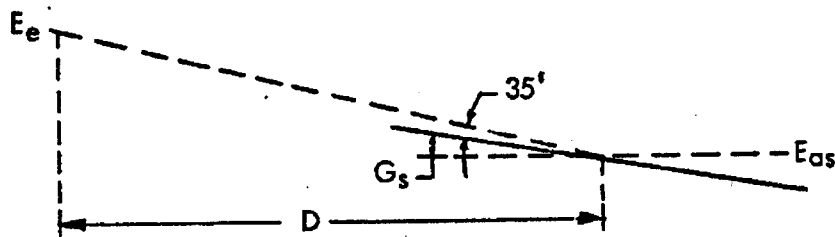
$$E_{as} = 100 \text{ ft. MSL}$$

$$D = 10,000 \text{ ft.}$$

$$G_s = -2 \text{ min.}$$

$$\begin{aligned} E_e &= 100 \text{ ft.} + [10,000 \text{ ft. Tan. } (35 \text{ min.} - 2 \text{ min.})] \\ &= 100 \text{ ft.} + (10,000 \text{ ft. Tan. } 33 \text{ min.}) \\ &= 100 \text{ ft.} + (10,000 \text{ ft.} \times .0096) \\ &= 100 \text{ ft.} + 96 \text{ ft.} \\ &= 196 \text{ ft. MSL} \end{aligned}$$

Example #2:



$$E_e = ?$$

$$E_{as} = 100 \text{ ft. MSL}$$

$$D = 10,000 \text{ ft.}$$

$$G_s = +2 \text{ min.}$$

$$\begin{aligned} E_e &= 100 \text{ ft.} + [10,000 \text{ ft. Tan. } (35 \text{ min.} + 2 \text{ min.})] \\ &= 100 \text{ ft.} + (10,000 \text{ ft. Tan. } 37 \text{ min.}) \\ &= 100 \text{ ft.} + (10,000 \text{ ft.} \times .01076) \\ &= 100 \text{ ft.} + 107.6 \text{ ft.} \\ &= 207.6 \text{ ft. MSL} \end{aligned}$$

4. RESPONSIBILITY FOR SITE PROTECTION. In the process of acquiring the property for an airport traffic control tower, provision shall be made for the protection of the site against future construction of any additional airport buildings, hangars, etc., that would create conditions such that the facility would not then meet the criteria set forth herein.
5. SITING PROCEDURES. The optimum siting of any control tower requires a thorough and complete study of many factors. Conformance to a standard procedure will assist in making good site selections on a uniform basis. A suggested procedure for selecting a site is set forth as follows:

- a. Office Study.

- (1) Utilizing the most up-to-date airport master plan, aerial mosaic, obstruction chart, and airport topography map, tentative site selections are made.
- (2) Verify the accuracy of the airport master plan with the regional airports division. The firmness of the airport master plan should be determined, the importance thereof stressed, and the availability of tentative sites discussed with the airport management. The policy provisions of Order 6930.17, Air Traffic Control Tower Structures, should also be reviewed with the airport management.
- (3) The visual requirements from the tower cab, as determined from an airport structure plan indicating structure heights, will indicate the approximate structure heights required.
- (4) Consider the obstruction criteria defined in Part 77, FAR, and its applicability to the various sites considered.
- (5) Consider the effect a control tower structure would have on existing and planned navigational/radio/radar aids located on the airport.
- (6) Analyze at least three tentative sites.

- b. Field Study.

- (1) Conduct field review of the office selected tentative sites plus other sites that merit consideration based on discussions with airport authorities and the on-location surveys.
- (2) Consider in the survey of each site the availability and cost of access roads, utility extensions and FAA facility cable relocations. Determine ground conditions in order to evaluate the matter of structural support of the tower superstructure and drainage.

- (3) Evaluate the impact on airport management of tentative site selections, tower heights, access road requirements, extension of utilities and property availability.
- (4) Conduct photographic panoramic studies of visibility from the proposed cab height at the site recommended in the report to record anticipated operational visual capability.

c. Site Recommendations.

Based on the findings of the office and field studies, the survey data will be finalized and maintained on record in the region. This may be accomplished as part of the documentation required to satisfy Order OA 6030.6, Establishment of Regional Facilities Review Boards. Survey data for each site should include as a minimum:

- (1) Site location relative to the airport master plan layout.
- (2) Height of structure required.
- (3) Explanation of compliance or reasons for deviations for each of the siting requirements stated in Appendix 1, paragraph 2, SITING CRITERIA.
- (4) Panoramic pictures related to cab eye level from the recommended site, oriented to true north and for the complete 360° horizontal plane around the site. These should be color photographs to allow precise interpretation of the surfaces and objects viewed.
- (5) Shadow map showing areas of visibility restriction due to other structures.
- (6) Availability of access road, utilities and facility cabling routes.
- (7) Economic evaluation of sites including estimated cost of structure, site preparation, access road, extension of utilities, etc.
- (8) Drawing showing the airborne airport traffic pattern and ground pattern, if significant.

6. SITE APPROVAL. Final approval authority of the control tower site will be the regional director in accordance with the procedures stated in Order OA 6030.6.

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